California Dairy-Sourced RNG Interconnection Update

DAIRY DIGESTER DEVELOPER CASE STUDY

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MAAS ENERGY WORKS

Overview

- State of Dairy Digester Industry
- RNG Injection Case Study
- Utility Injection Standards
- Recommendations


Free Stalls
Covered Lagoon Manure Digester

Our Resource

1  =

And - 1 () CO2-e

Shift from Power to Gas

Digesters Built in California

All Others

Electrical Generation

Pipeline Injection

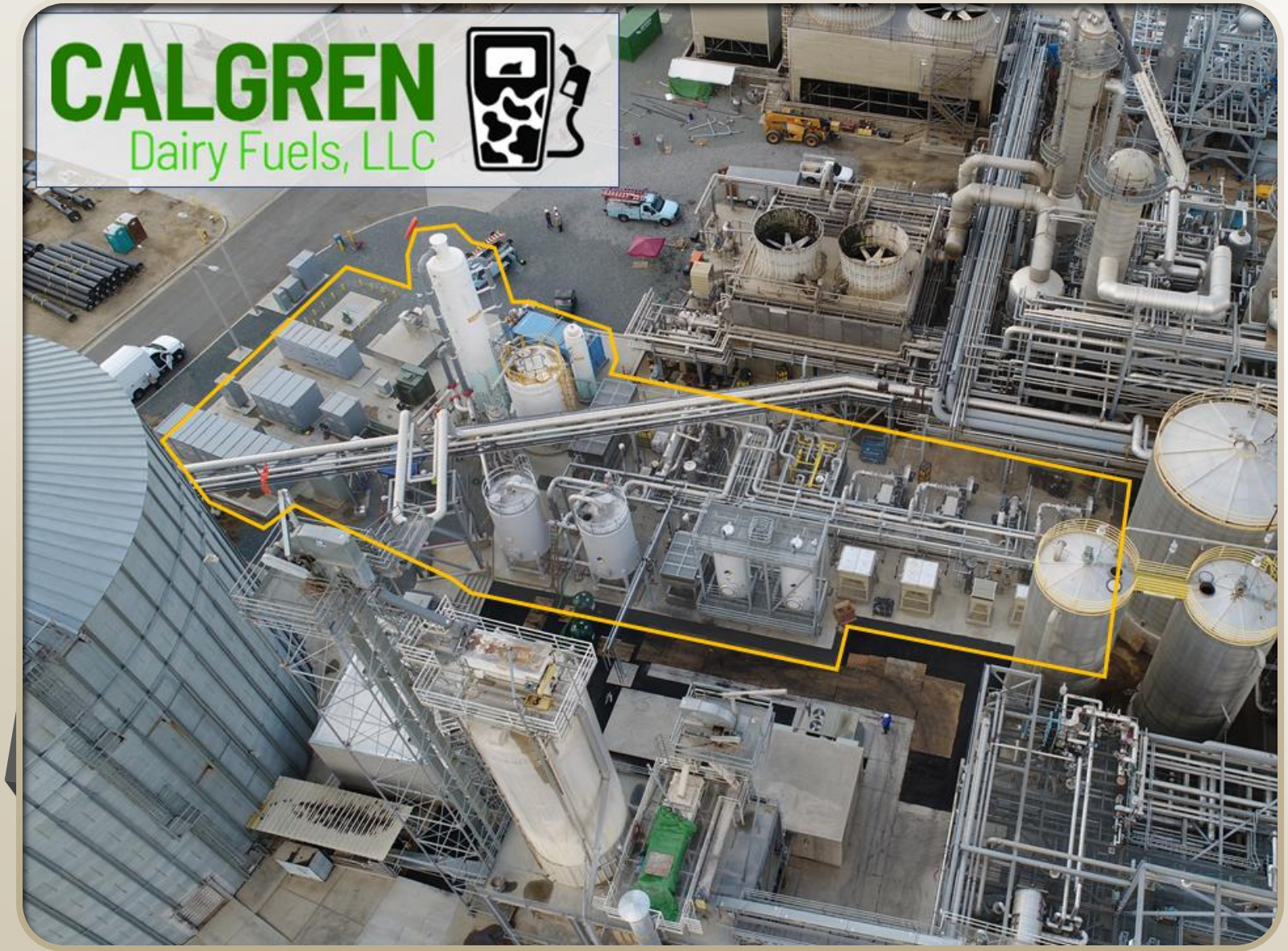
Lakeview Farms Dairy, West Star North Dairy, Carlos Echeverria & Sons Dairy
Feb 2018

ABEC #1 Bidart - Old River
Dec 2014

New Hope Dairy, July 2013
Shut Down, June 2016
Acquired by MEW Sept 2018

Maas Energy Works

- Still Water Dairy, Sept 2019
- K&M Visser Dairy, Sept 2019
- Vander Poel Dairy, August 2019
- New Hope Dairy, July 2019
- Sousa & Sousa Dairy, June
- Cornerstone Dairy, April 2019
- Van Beek Bros. Dairy, Jan 2019
- Van der Eyk Dairy, Dec 2018
- Legacy Ranch, Dec 2018
- Circle A Dairy, Aug 2018
- GJ TeVelde Ranch, June 2017
- Philip Verwey Farms #1, May 2017
- Philip Verwey Farms #2, Oct 2016
- Open Sky Ranch, Aug 2016
- Van Steyn Dairy, Sept 2015
- Pacific Rim Dairy, Nov 2014
- Pixley Biogas (Calgren Ethanol), Sept 2014
- Van Warmerdam Dairy, May 2013



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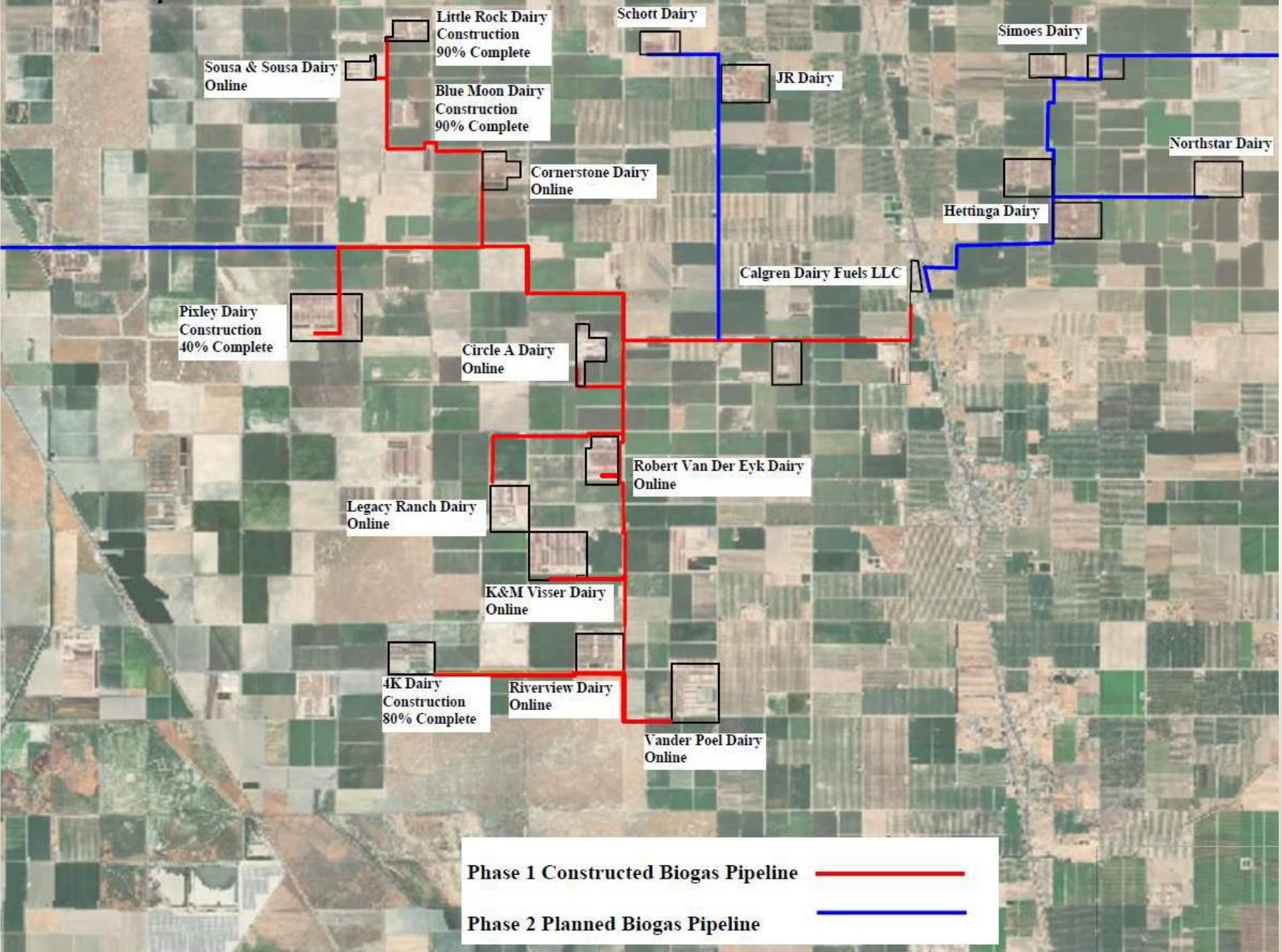

Calgren Dairy Fuels Cluster

- Maas Energy Works – Lead Developer
- 8 Digesters online injecting RNG to SoCalGas Pipeline
- Expanding to 20+ total dairies
- ~4M GGE/year CNG

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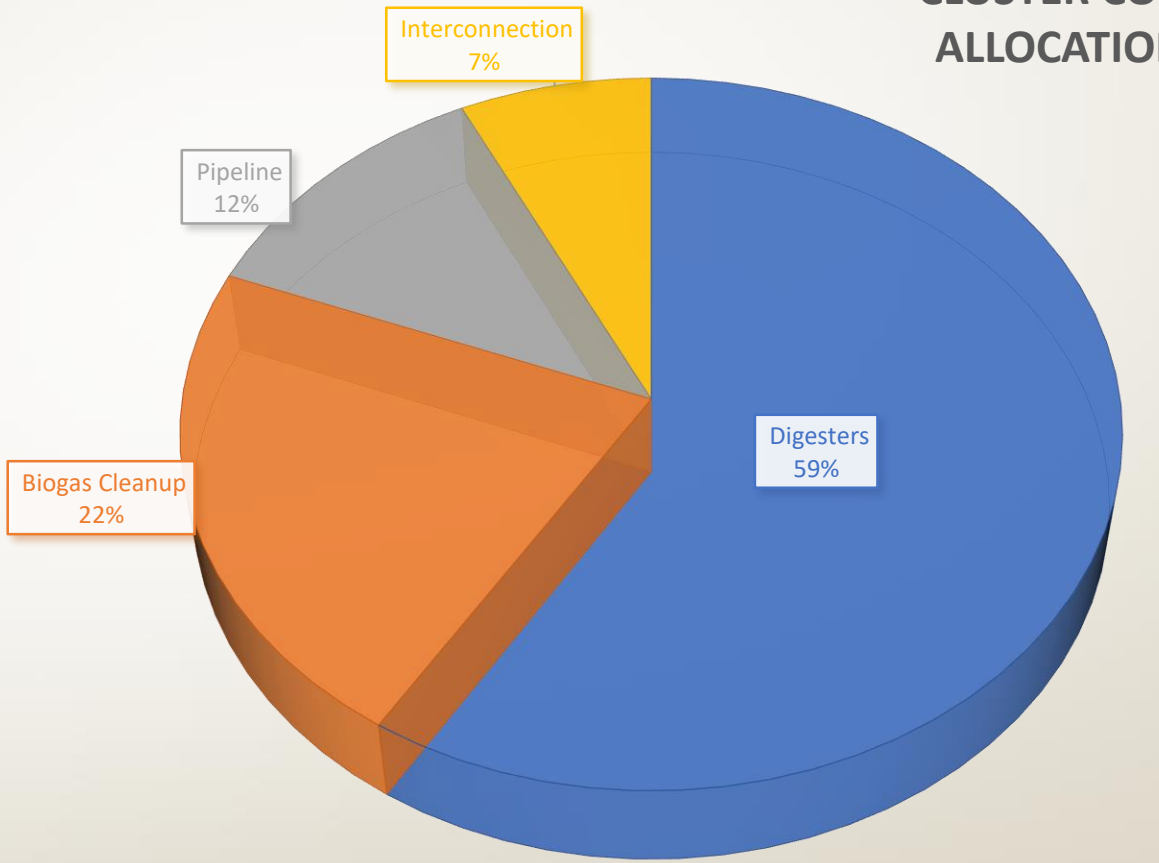
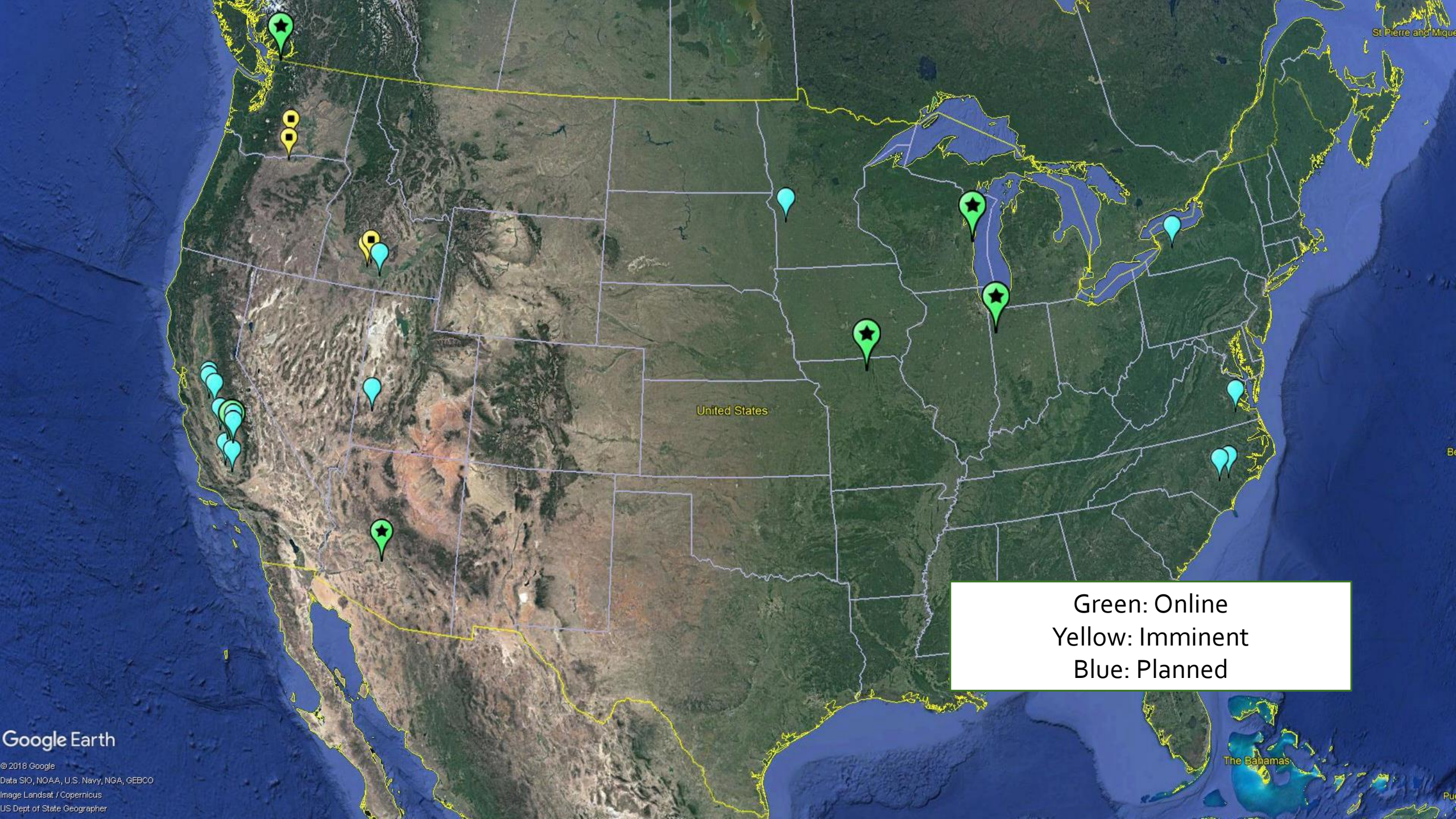
CLUSTER COST ALLOCATION

Digesters	$	30,075,000
Biogas Cleanup	$	11,200,000
Pipeline	$	6,050,000
Interconnection	$	3,700,000
Total	**$**	**51,025,000**



Virtual Pipeline Online!


United States
The Bahamas
Green: Online
Yellow: Imminent
Blue: Planned
Google Earth
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Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
US Dept of State Geographer

Thoughts and Recommendations

Interconnect Funding

- AB-2313
  - Reimbursement
  - Based on injection date
  - Limited pool of funds (raise bar)
- Pilot Project
  - Paid by utility directly
  - One-time cycle
- Expansions (Critical!)
  - AB-2313 eligibility for additional investments beyond Pilot Project

Interconnect Case Studies

		Calgren Dairy Fuels	Lakeside Pipeline	Merced Pipeline
Regs	Utility	SoCalGas	SoCalGas	PG&E
	Tariff	Rule 39 (old)	Rule 39 (new)	Rule 21 (new)
	Pilot Project?	No	Yes	Yes
Gas Spec	Oxygen	0.20%	0.20%	0.10%
	CO-2	3%	3%	1%
	H2S	4 ppm	4 ppm	4 ppm
	Nitrogen (inerts)	4%	4%	n/a
	BTU	990 BTU	970 BTU*	980**
Method	Engineered By	Owner	Utility	Utility
	Construciton By	Owner	Utility	Utility
Results	Total Time	23 Months	35 Months (est)	35 Months (est)
	Total Cost	$1,746,039	$2,071,825 (est)	$1,700,000 (est)

* higher due to other limits

** project specific

Statewide Tariff Recommendations

- II.B. states SoCalGas will use the existing Interconnect Collectible System Upgrade Agreement
  - Delays in establishing collective
  - Impossible warranty provisions (fixed with one-time advice letter)
  - Agreement needs modification (PG&E TBD)
- Self-Design (CPUC D.07-08-029 section 4.13.2)
  - III.A. (bottom of page 7) states that utility will perform the design engineering.
  - In the tariff F 2 (c) states utility "will design and engineer….or provide specifications, inspection, and oversight…if applicable"
  - Interconnector's sole discretion must be explicit